

## FINAL REPORT: NASA GRANT NAG 9-39

*Geochemical evolution of the Earth, Moon, igneous meteorites, and other terrestrial planetary bodies*

*P.I. Michael J. Drake  
University of Arizona*

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The following peer-reviewed publications result from the above-referenced grant.

H.E. Newsom and M.J. Drake (1983) Experimental investigation of the partitioning of phosphorus between metal and silicate phases: Implications for the Earth, Moon and Eucrite Parent Body. *Geochim. Cosmochim. Acta* **47**, 93-100.

J.H. Jones and M.J. Drake (1983) Experimental investigations of trace element fractionation in iron meteorites, II: The influence of sulfur. *Geochim. Cosmochim. Acta* **47**, 1199-1209.

A.H. Treiman and M.J. Drake (1983) Origin of lunar meteorite ALHA 81005: Clues from the presence of terrae clasts and a very low-titanium mare basalt clast. *Geophys. Res. Lett.* **10**, 783-786.

M.J. Drake (1983) Geochemical constraints on the origin of the Moon. *Geochim. Cosmochim. Acta* **47**, 1759-1767.

W.M. Kaula, M.J. Drake, and J.W. Head (1984) The Moon. In *Natural Satellites* (edited by J.A. Burns and M.S. Matthews), 581-628. Univ. of Arizona Press, Tucson.

M.J. Drake, H.E. Newsom, S.J.B. Reed, and M.C. Enright (1984) Experimental determination of the partitioning of gallium between metal and silicate: Electron and ion probe study. *Geochim. Cosmochim. Acta* **48**, 1609-1615.

A.H. Treiman and M.J. Drake (1985) Basaltic volcanism on the Eucrite Parent Body: Petrology and chemistry of the polymict eucrite ALHA 80102. *Proc. Lunar Planet. Sci. Conf. 15th, Jour. Geophys. Res.* **90**, C619-C628.

S.J. Weidenschilling, R. Greenberg, C.R. Chapman, F. Herbert, D.R. Davis, M.J. Drake, J.H. Jones, and W.K. Hartmann (1986) Origin of the Moon from a circumterrestrial disk. In *Origin of the Moon* (edited by W.K. Hartmann, R.J. Phillips and G.J. Taylor), 731-762. Lunar and Planetary Institute, Houston.

M.J. Drake (1986) Is lunar bulk material similar to Earth's mantle? In *Origin of the Moon* (edited by W.K. Hartmann, R.J. Phillips and G.J. Taylor), 105-124. The Lunar and Planetary Institute, Houston.

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M.E. Kreutzberger, M.J. Drake, and J.H. Jones (1986) Origin of the Earth's Moon: Constraints from alkali volatile trace elements. *Geochim. Cosmochim. Acta* **50**, 91-98.

J.H. Jones and M.J. Drake (1986) Geochemical constraints on core formation in the Earth. *Nature* **322**, 221-228.

A.H. Treiman, M.J. Drake, J. Hertogen, M.-J. Janssens, R. Wolf, and M. Ebihara (1986) Core formation in the Earth and shergottite parent body (SPB): Chemical evidence from basalts. *Geochim. Cosmochim. Acta* **50**, 1071-1092.

D.J. Malvin, J.H. Jones, and M.J. Drake (1986) Experimental investigations of trace element fractionation in iron meteorites III. Elemental partitioning in the system Fe-Ni-S-P. *Geochim. Cosmochim. Acta* **50**, 1221-1232.

J.H. Jones and M.J. Drake (1986) Constraints on the Origin of the Moon. *Geochim. Cosmochim. Acta* **50**, 1827.

J.H. Jones and M.J. Drake (1986) Core formation and Earth's late accretionary history. *Nature* **323**, 470-471.

A.H. Treiman, J.H. Jones, and M.J. Drake (1987) Core formation in the shergottite parent body: A chemical model. *Proc. Lunar Planet. Sci. Conf. 17th*, E627-E632.

M.J. Drake (1987) Siderophile elements in planetary mantles and the origin of the Moon. *Proc. Lunar Planet. Sci. Conf. 17th*, E377-E386.

M.J. Drake, W.V. Boynton, and D.P. Blanchard (1987) The case for planetary sample return space missions: I. Origin of the Solar System. *EOS* **68**, 111-113.

M.J. Drake and W.V. Boynton (1988) Partitioning of Rare Earth Elements between Hibonite and Melt and Implications for Nebular Condensation of the Rare Earth Elements. *Meteoritics* **23**, 75-80.

M. J. Drake, H. E. Newsom, and C. J. Capobianco (1989) V, Cr, and Mn in the Earth, Moon, EPB, and SPB and the Origin of the Moon: Experimental Studies. *Geochim. Cosmochim. Acta* **53**, 2101-2111.

C.A. Goodrich, P.J. Patchett, Lugmair G., and M.J. Drake (1991) Sm/Nd isotopic systematics of ureilites: a 3.74 Ga isochron for Kenna. *Geochim. Cosmochim. Acta* **55**, 829-848.

D.S. Musselwhite, M.J. Drake, and T.D. Swindle (1991) Early outgassing of Mars: Inferences from the geochemistry of iodine and xenon. *Nature* **352**, 697-699.

G. Schubert, S.C. Solomon, D.L. Turcotte, M.J. Drake, and N. Sleep (1992) Origin and thermal evolution of Mars. In "Mars", (B.M. Jakosky, H.H. Kieffer, and C.W. Snyder, eds.) University of Arizona Press.

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C.L. Broadhurst, M.J. Drake, B.E. Hagee, and T.J. Bernatowicz (1992) Solubility and partitioning of Ne, Ar, Kr, and Xe in minerals and basaltic melts. *Geochim. Cosmochim. Acta* **56**, 709-723.

J.H. Jones, C.J. Capobianco, and M.J. Drake (1992) Siderophile elements and the Earth's formation. *Science* **257**, 1281-1282.

C.J. Capobianco, J.H. Jones, and M.J. Drake (1993) Metal/silicate thermochemistry at high temperature: Magma oceans and the "excess siderophile element" problem of the Earth's upper mantle. *Jour. Geophys. Res. Planets* **98**, 5433-5443.

P. Beattie, M.J. Drake, J.H. Jones, C. Langmuir, W.P. Leeman, J. Longhi, G.A. McKay, R.L. Nielsen, H. Palme, D. Shaw, and B. Watson (1993) A terminology for trace element partitioning. *Geochim. Cosmochim. Acta* **57**, 1605-1606.

J.H. Jones and M.J. Drake (1993) Rb and Cs in the Earth and Moon. *Geochim. Cosmochim. Acta* **57**, 3785-3792.